

PDR IR-X210 MANUAL



•SMT/BGA Rework Solutions•

Introduction

This product was manufactured by PDR (A Division of Eurotec Industries Limited, UK) and is supplied by a worldwide network of professional distributors who provide a full range of sales/service/support services. For latest information on new products, upgrades etc. please call your distributor for assistance, or contact us at:

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This manual is structured to enable a technician with no previous knowledge of the system to become familiar with the operation and maintenance of the equipment. It contains a technical description to enable the reader to understand the design features of the equipment. The safety section of the manual explains the inherent dangers presented by any type of desoldering/soldering equipment, and warnings to minimise the risk of injury through ignorance.

Terminology

The following lists terms and abbreviations used in this manual, which may need explanation:

<u>Term</u>	<u>Explanation</u>
a.c.	Alternating current - as found in "mains" supplies
D.R.O.	Digital Read Out - the displays of the controller
IR	Infrared - the invisible part of the electromagnetic spectrum, used to heat objects.
L.E.D.	Light Emitting Diode - used for several of the controller's displays
P.C.B.	Printed Circuit Board
R.F.	Radio Frequency
S.M.D.	Surface Mount Device

Safety

Health and Safety at Work

The attention of users in the UK is drawn to the requirements of the Health and Safety at Work Act. Users in other countries should familiarise themselves with the requirements of local health and safety legislation.

The IR-X210 is an electrical heating device and therefore misuse can lead to electric shock or burning.

Warnings & Cautions

For the purposes of this manual a warning refers to a danger of injury to the operator whereas a caution refers to a danger of damage to the equipment. The warnings and cautions detailed are basic safety requirements and are intended to ensure operator awareness of the dangers of the equipment.

Warnings

- Do not allow the IR spot from the hand tool (either directly or via a mirror) to come into contact with the eyes as serious eye damage may occur.
- Do not allow the IR Spot from the hand tool to come into contact with any exposed skin other than for a very short period, since tissue damage may result.
- Do not touch the white ceramic back heater element, since there is a risk of burning or tissue damage.
- Do not tamper with the electrical control unit or any wiring - you may be subjected to a severe electric shock.
- When placing work under the hand tool, to prevent unwanted localised heating ensure the IR spot is switched off.
- Death or serious injury may result from electric shock. It is therefore essential to isolate the equipment from the mains before commencing repairs.
- To eliminate the possibility of burns, allow time for the equipment to cool before commencing maintenance.
- Check the safety of the IR-X210 system installation regularly - a safety expert must carry this out.
- If in doubt with any aspect of the IR-X210 - contact PDR or your supplier.

Cautions

- Damage due to overheating may result from the equipment being left in any state other than idling or shutdown for any period when the equipment is not in continuous use.
- To eliminate the possibility of accidental operation of the footswitch ensure that it is located in a position where nothing can rest or fall on it.
- Do not allow the spillage of any liquid to fall onto the ceramic emitter (back heater) as damage may result.
- Due to the use of glass optical components and lamps the IR-X210 should be handled with care.

Installation



INSTALLATION

Siting

The equipment must be sited on a firm surface at least one metre square and at a height to suit the operator. The location should be chosen to suit the flow of work. The immediate areas must be free from draughts that may reduce the heating efficiency.

The lighting should not be so bright as to prevent the operator from viewing the I.R. spot or the controller's L.E.D. displays.

A mains electricity supply, free from R.F. interference, other noise, glitches etc., must be readily available.

The hand tool will need to be close to the controller, and within easy reach of the backheater so that rework can be easily carried out.

Connections

1. Connect the hand tool to the back of the controller.
2. Connect the back heater to the back of the controller.
3. Place the hand tool footswitch on the ground, but so that it cannot be accidentally operated.
4. Lastly, connect the controller to the mains electricity supply.

PRINCIPLE OF OPERATION

Overview

The principle of operation of the IR-X210 rework unit is that whilst being heated from above and below, a single S.M.D. is subjected to the same temperature/time profile during rework, as it is during reflow in the original reflow oven.

In operation the board is first put through a preheat stage, followed by the component being put through a reflow stage.

The IR-X210 is designed for rework on double sided and mixed technology printed circuit boards. The top heat is derived from a 150 Watt short-wave I.R. lamp focused through a system. The bottom heater delivers a maximum of 500 watts medium wave I.R.

In normal use, the top heater provides approximately 25% of the energy, and 75% of the energy is provided by the back heater. Figure 1 shows how the energy is applied to a component.

TECHNICAL DESCRIPTION

IR Hand Tool

The IR hand tool comprises an IR lamp, a focusing arrangement, and a filter.

IR Lamp

The 150 Watt IR lamp is located in the lamp housing at the front end of the hand unit. The lamp emits mostly short wave IR radiation at approximately 1.0micron wavelength.

Focusing Arrangement

The focusing arrangement concentrates the optical energy to obtain a maximum of energy at the filter.

Filter

The optical filter prevents all the visible light from being transmitted. This reduced the amount of glare reflected from the solder or tin from the circuit boards, yet allows as much IR energy to be transmitted as possible.

Control System

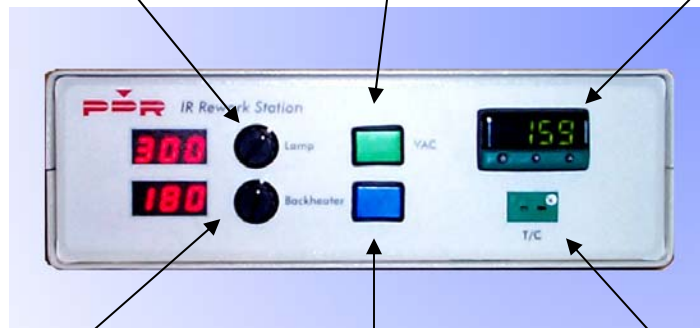
The main control box is used to provide electrical power to the various functions...top heat, back heat, vacuum, thermocouple inputs etc....all the control features and parameters are easily adjustable and simple to use (the main front panel is shown below and detailed operating instructions are described in the section 'Soldering and Desoldering').

Features

- **Topheat intensity control**

- **Vacuum on/off switch**

- **CAL Temperature controller**



- **Backheat intensity control**

- **Backheat on/off switch**

- **Thermocouple input**

Top Heat

The top heat adds heat to the process and brings the solder joint temperature up to reflow. The heating process of the IR-X210 is a combination of Back Heat and Top heat. The Back Heater heats the PCB, pads, and leads of the component up to 120-140°C and Top Heat increases the temperature further until you reach reflow.

Back Heat

The backheat is applied by a 500 Watt (or optional 1200 Watt) medium-wave infrared emitter controlled by the software/digital controller and performs three functions:

1. It reduces the risk of thermal shock and PCB de-lamination (PCB blistering)
2. It counteracts the heat sink effect of a power plane in the PCB.
3. It preheats the PCB and component.

Thermocouples

Any K-type thermocouple (T/C) can be used and displayed. A sensor, non-contact IR thermocouple - T/C #1 is aimed at the component and is used to control the component/PCB temperature by switching the Topheat and Backheat.

Workholder

The workholder is lockable and capable of holding a board up to 290mm by 210mm.

What Top Heat Setting should you use?

Between 180-380°C. Only increase the top heat after you have increased the back heater to the required temperature. Always preheat the PCB (between 30 -90 seconds) to allow the heat to conduct through the component before introducing the Top Heat.

What's the working distance of the IR-X210 and how do I move it for rework?

Approximately 5-10mm when reworking and move up to 30mm when removing Component - move the hand tool in a scanning motion to heat leads, taking about one second for each scan of the component.

Back Heat

The Back Heater's function is to preheat the PCB and component; this protects the PCB from delaminating and the component from thermal shock. The Back Heater also equalises the conductive effect of the ground plane of the PCB.

The ceramic heater preheats the PCB and the heat conducts through the PCB and preheats the component, so when you introduce the Top heat there is no chance of thermal shock. The balance of heat energy supplied should be approximately 75% from the Back Heater and 25% from the Top Heat.

What Back Heat setting should you use?

Generally 180°C set on the Back Heater is a good starting point. If the process takes longer than 180 seconds then increase the Back Heater by 20°C increments to reduce time taken. With the correct Back Heater setting the top of the PCB will reach approximately 120-140°C in about 60-120 seconds.

<u>Typical Thermal Profile</u>	<u>Balance of Heat Applied</u>
Reflow Temperature	Top Heat (25%)
120/140°C	(75%) Back Heater
Preheat Top Heat	

The CAL Temperature Controller

The CAL controller has 2 setpoints that are used. Setpoint 1 controls the backheat. Setpoint 2 controls the topeat.

In use Setpoint 1 is set at about 180-200°C and Setpoint 2 is factory set at 220°C. A contact or non-contact K-type sensor is used to input the temperature of the component/PCB during rework. The sensor should be set to read the temperature of the edge of a component during rework and the CAL display will at all times display the temperature being measured by the sensor.

During rework, the sensor will record the temperature as it climbs from around 20°C to reflow. If setpoints 1 and 2 are set at say 180°C and 220°C, the backheater will switch off when Setpoint 1 is reached (to avoid overheating the PCB, and also avoid components dropping off the bottom of the PCB) and the Topheat will cut out when setpoint 2 is reached (to avoid overheating the component)

To adjust setpoint 1, press and hold the * button and press the up or down arrow to adjust the setpoint. Setpoint 2 is factory set at 220°C. It can be adjusted.....contact support@pdr.co.uk for help.

The non-contact sensor should be set to 'look' down at the component from the front, about 75mm/3in. away and at about 45° angle.

TECHNICAL SPECIFICATION

Supply Voltage:	110/220/240V a.c. 50/60Hz
Power Consumption:	700 Watts maximum
IR Beam:	150 Watts maximum focused short wave I.R.
Back Heat:	500 Watt controlled medium-wave I.R. radiator
Operating Temperatures:	Top Heat: Approx. 40°C to approx. 440°C Back Heat: Approx. 40°C to approx. 270°C
Component Range:	Typically chip resistors/capacitors, SOIC's, QFP's, PLCC's, BGA's, sockets and connectors etc.
PCB Maximum Size:	Width - 390mm Depth - 460mm
Workspace Dimensions:	450 x 450mm Weight: 4kg for basic machine

PREPARATION

Tools and Materials Required

The following is a list of tools recommended for use in desoldering/resoldering operations:

- Flux gel, or low solids flux with dispenser bottle (Alpha Metals flux is recommended for PDR IR Rework units).
- Set of tweezers, fine tipped
- Flux remover
- Soldering iron - fine point
- Solder braid

The procedure while preparing to rework components is as follows,

- **Switch on and warm up**
- **Set 'control settings'** required for PCB/component
- Sort **tools and fluxes** required

Switch on and warm up

The following simple procedure will warm the system up

- **Switch on** the 1500 Controller
- **Set control settings** - see below
- **Allow system to warm up** - 5 to 10 minutes

Basic control settings

- Set Top Heat and Back Heater power settings - (Top Heat set 220 - 380 °C, Back Heat set 180 °C)
- Set CAL temperature controller settings - (Setpoint 1 set 180-200 °C, Setpoint 2 factory set 220°C)

To Operate the Unit

Once the unit is switched on, the fan will operate to cool the hand tool. This is normal. Select the correct operating temperatures for the back heater and the top heater. Leave the equipment to stabilise for about 10 minutes before starting any rework.

OPERATING PROCEDURES

Start Up

The following procedure should be applied to place the equipment in the stand-by mode.

- Set the POWER (mains) switch to 'on' and check that the control unit displays a temperature on the read out.

Preparation before Soldering/Desoldering a component

- Set Top Heat and Back heater - (Top Heat 220°C - 380°C, Back Heat 180°C)
- Always place PCB on board support, with the component over the centre of the back heater.
- Always apply flux to joints before reflow - use a low solids, or gel/paste type flux (flux gel is best for rework)
- Before replacing a component, always clean any flux residue off the PCB
- Before replacing a component, check that there is enough solder on the pads to solder new component.
- Before replacing a component, check that the new component does not have any bent leads.

Removing a component

- Apply flux - to solder joints
- Preheat - waiting 30-90 seconds for the flux to turn into liquid
- Reflow - introduce the Top Heat/Hand Tool (there will be two bursts of smoke (flux flumes), and on the second one, you should have reached reflow).
- Remove component - with the IR-X210 raised about 30mm above the component and using tweezers, or a vacuum pen.

Replacing a component

- Apply flux - to solder pads - use gel on a cooled board for best activity
- Place and align component onto fluxed pads
- Preheat - waiting 30-90 seconds for the flux to turn into liquid
- Reflow - introduce the Top Heat/Hand Tool (there will be two burst of smoke (flux fumes). On the second one you should have reached reflow).
- Using the tweezers gently tap the PCB 3 times to help alignment.

Aftercare

- Clean flux residue off PCB
- Check solder joints
- Test

Shutdown

If the equipment is to be left unused for more than one hour, switch off mains supply using the controller's POWER switch.

REWORK TIPS

- Use Flux Gel. When it turns from a gel into a fluid/liquid, this indicates that the PCB is preheated and you can add the Top Heat. Flux Gel also helps placement of the component.
- If the Backheater heat is too low or preheating time too short, when you add the Top Heat, the heat will be conducted away by the PCB's ground plane, which will increase the time it takes to reflow.
- The longer the preheat the PCB the less Top Heat you need.

- When the solder is fully molten, tap the PCB, and watch the surface tension of the solder draw the component into perfect alignment.

MAINTENANCE

Warning - All cleaning or maintenance should be performed when the machine is switched off and isolated from the mains supply, and has been allowed to cool to avoid the operator accidentally receiving burns from hot parts of the machine.

Cleaning

At the end of each working day, wipe any surplus flux and/or solder paste from the equipment with a clean cloth.

Periodically clean the exposed surfaces of the equipment with soft cloth and anti-static foam cleaner.

The lens assembly should be cleaned using Iso-Propylalcohol. Care should be taken to ensure that the lens cloth is clean as any contamination of the cloth could cause scratching of the glass surfaces.

Caution: Do not use solvents for cleaning any part of the equipment as they may damage the finish.

Changing Fuses

Fuses should only be changed with the equipment switched off, and the equipment isolated from the electrical supply by removing the IEC plug from the machine.

The mains fuse is located at the back of the equipment and is changed by withdrawing the fuse holder and withdrawing the fuse. The correct fuse is a 3.15A, 250V, 20mm anti-surge (T).

Changing the I.R. Lamp

The I.R. lamp may be changed by the following procedure:

- Ensure that the equipment is isolated from the mains supply
- Release the focusing part of the hand tool by twisting and releasing the bayonet fitting.
- Withdraw the lamp from the housing. Fit replacement taking care to handle only the outside edges of the glass reflector.
- Refit the focusing part of the hand tool twisting and compressing the bayonet fitting.

Note: If the bulb within the lamp is touched then the lamp may fail prematurely.

TROUBLESHOOTING

If in doubt, or require further assistance, please do not hesitate to contact PDR Technical Support. Full support is offered through PDR's worldwide network of sales outlets. Please contact your local agent or the agent the machine was purchased from.

Contacting Technical Support

If in doubt, or further assistance is required, please do not hesitate to contact PDR Technical Support (Europe/Asia email: support@pdr-smt.com or throughout North America email: support@pdr-america.com).

Full support is offered through PDR's world-wide network of sales outlets. Please contact your local agent or the agent the machine was purchased from.

Mains Fuse

This should be checked first when any malfunction arises. The fuse (20mm, T/Anti-surge, 10Amp), is located at the back of the controller adjacent to the mains input.

Bulb no longer works

This may be caused by either a blown fuse, the lamp's age, corroded lamp pins or a defective lamp socket.

Lamp Age/Life

A lamp has a life expectancy of 30,000 cycles or 50 hours at full power. If burnt in appearance, replace with a new lamp.

Corroded lamp pins

With residue on the pins of the lamp may prevent proper contact between the lamp's pins and the lamp socket. Therefore remove the lamp and clean the pins with abrasive paper.

Back heater malfunctions

This may be caused by either a blown mains or a problem with the back heater connections. Check that the back heater is connected to the controller.

WARRANTY

Terms of Warranty

PDR warrants this product to be in good working order during the Warranty Period, from the date of delivery from PDR or a PDR authorised distributor, until six months hence. Should this product not be in good working order upon receipt, or within six months of delivery date, PDR will, as its option, repair or replace the product at no additional charge except as set forth below:

This warranty covers failure due to faulty materials or workmanship.

This warranty does not cover the repair of damage to the product resulting from accident, disaster, misuse, abuse, unauthorised repairs, the attachment of non-PDR approved accessories, or non-PDR approved modifications.

Service under the conditions of this warranty may be obtained by delivering the product during the warranty period to PDR or a PDR authorised distributor.

Except as expressly stated herein, all conditions, warranties, representation and undertakings, express or implied, are excluded.

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